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GUAM AGRICULTURAL EXPERIMENT STATION,

C. W. EDWARDS, Animal Husbandman in Charge,
Island of Guam.

CIRCULAR No. 1.

Under the supervision of the STATES RELATIONS SERVICE,
Office of Experiment Stations, U. S. Department of Agriculture.

**PARA AND PASPALUM
GRASSES.**

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BY

GLEN BRIGGS, Agronomist.



Issued January 19, 1921.



**WASHINGTON
GOVERNMENT PRINTING OFFICE**

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[Under the supervision of A. C. TRUE, Director, States Relations Service, United States Department of Agriculture.]

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Among the earliest experiments undertaken by the Guam Agricultural Experiment Station were some with grasses introduced to replace the native species, which are poor in quality and often deficient in quantity. Pastures are the foundation of animal husbandry, and grasses form the basis of animal production. The development and expansion of the animal industry in Guam depends upon the production or introduction of grasses suitable for grazing purposes. After a great many trials covering the work of several years at the station it has been fully proved that the native grasses of Guam are lacking in the palatable and nutritive qualities so essential to extensive animal production. Very satisfactory results, however, have been obtained from certain introduced grasses which enable more stock to be carried on given areas than the native grasses will support.

There is great need for grasses which will insure the farmer against sacrificing his live stock when the weather becomes unfavorable for the growing of most of the local grasses and forage crops. Such grasses are to be found in the improved pastures planted to introduced grasses. Inasmuch as long dry seasons are of frequent occurrence in Guam, the amount of feed furnished by the native pastures is always uncertain. The ability of the introduced grasses to furnish a large amount of feed during the drought makes them much superior to the native grasses, which are apt to suffer and die during these periods.

At present the production of meat in Guam is not adequate to meet the demand of the local Chamorro population, nor is it likely

to be for some time to come, while the requirements of the United States Navy and marine detachments and other nonnative residents seem to assure a market for future maximum production. The local supply of meats is inferior in quality to the imported, largely due to lack of nutritive forage. The introduced grasses should be encouraged, in order that this difficulty may be overcome. They have a larger carrying capacity than the native grasses, and being more palatable and nutritious would cause a quicker and more even maturity of the animal, thus greatly aiding in the production of good meat.

The Guam experiment station has devoted much time and attention to testing the different kinds of grasses most likely to meet the needs and conditions of the Guam farmer, and has found *Para* and *Paspalum* grasses much superior to the native or other introduced grasses tested.

PARA GRASS.

Para grass is rather a coarse grass having stems about the size of a lead pencil. It spreads out in a flat manner and develops runners that cover the ground, but as the grass continues to grow the younger stems assume a more erect position. It is a very vigorous grower and under favorable circumstances makes a thick growth from 2 to 5 feet high, depending upon the fertility of the soil. *Para* grass sends out roots at each node or joint where the runners come in contact with the wet ground.

There are many places in Guam where *Para* grass may be planted very profitably, but it is especially adapted to wet or moist land, and after it is once well started withstands drought remarkably well. Lowlands that remain wet throughout the year favor the growth of the grass. It survives after having been covered with water for periods of a month or more at a time and is able to grow on land that would be good for nothing else most of the year. Most of the villages of Guam are near some low, swampy areas that would be ideal for the production of this grass. These places are so situated that the cut grass would have to be hauled only a short distance for feeding the work animals of the village, or they could be pastured upon the grass in the field. The south end and west side of the island contain many abandoned rice fields that could be made to furnish an abundant supply of grass for soiling purposes or for pasturage. Were these fields planted to *Para* grass rather than to native grass they would furnish much more feed for the village work animals pasturing on them than they now yield. This grass might also be planted on ground that is newly cleared, such as forest land, old lands that have been growing other crops for several seasons, and some of the uplands that are located so that they secure some water

during all but the driest times of the year. Probably the best land of all is that which can be plowed and put into good tillable condition for the planting of the grass.

Para grass has been grown by the Guam station for the last 10 years, during which time it has furnished most of the forage fed to the animals. In years when the weather was so dry that the native pastures dried and burned, the Para grass at Piti and Cotot tided the stock over very critical periods until the rain started. The grass has been planted in various places on the island and in all cases has made satisfactory growth.

Para grass provides a very large yield on a very small area of ground. It is used both as a pasture and a green-cut forage for live stock. The dry seasons have especially emphasized the value of Para grass as a soiling¹ crop for Guam. Practically all of the native grasses fail during these periods, which frequently occur between March and July. Under exceptionally dry conditions the Para grass will attain a height of 3 feet and become fairly thick. On the low-lands it is cut about once in every five weeks. If the grass is cut at frequent intervals and not allowed to form thick, dry mats near the ground it will remain tender and succulent.

WHEN TO PLANT.

The time of planting Para grass depends wholly upon climatic and soil conditions. To enable the grass to make a rapid start it is necessary that the ground be at least moist. In general the best time to plant is at the beginning of the rainy season. The farmer is then certain that the plant is provided with water sufficient to enable it to develop a good root system and become well established before the dry season starts. Since it is easily killed when young, the grass should be well started before animals are allowed to graze upon it. The earlier in the rainy season the grass is planted the sooner it will become available for grazing or feeding purposes. While a good stand can be secured from later plantings, it is probable that the ground will not be completely covered with grass, but will require weeding, and the grass will hardly be well established before it is wanted for forage. Under extremely favorable conditions Para grass may cover the ground and reach a height of 3 feet in two months after being broadcasted or planted in rows. More often, however, it requires about four months' time in which to become well enough established for pasturing or for use as a soiling crop.

HOW TO PLANT.

Whenever possible land should be as thoroughly prepared for Para grass as for any other field crop. It is a great mistake to think that

¹ A soiling crop is forage cut in a green stage and fed to animals which are in stalls, inclosures, or tethered by ropes.

because grass is such a common and hardy plant it does not need a well-prepared seed bed. Young grass roots are tender and sensitive, and extra trouble taken in the preparation of the land will be repaid by the results obtained later. The proper preparation can be secured only by the use of the more modern farming implements, such as a steel plow and a spike-tooth or a disk harrow. It is, of course, impossible to plow new ground or to use modern machinery until the stumps have well rotted or been removed. On these areas the best preparation is to clean the land with a machete and fosiño so that the grass may become established before the other plants spring up.

Several ways of planting Para grass were tried at this station with more or less success. These included use of seed, roots, cuttings, stalks in furrows, and stalks broadcasted. The seed will not germinate well unless it has been carefully selected. The young plants grow slowly and should be given special attention so that weeds will be prevented from crowding out and ultimately killing them. The use of roots was found to be too costly for ordinary planting. The other three methods of planting are somewhat alike in that portions of the stems are used for propagation. The cuttings are made by dividing the stems into sections varying from 8 to 12 inches in length and planting them in hills 3 to 6 feet apart so that one or two nodes or joints are covered with soil. From these nodes roots soon put out and begin to grow. Planting stalks in furrows that have been opened by a plow has been one of the most satisfactory methods of growing this grass and one of the cheapest, while it is the surest and probably the quickest way of starting a good field. Furrows should be laid off 3 or 4 feet apart across the field. Para grass stems should then be thickly scattered in the furrows and covered with soil that is lightly packed down so that the field will be level. Very satisfactory results were obtained by broadcasting or scattering the stems on the surface of the soil during the rainy season. In areas where new clearings have been made, where grass and weeds have not yet started, and where stumps prevent the use of modern machinery, the stems may be scattered on the soil without other preparation. The beating rains will soon cover the Para grass sufficiently for it to take root, which it very readily does whenever a node comes in contact with the soil.

COST OF PLANTING.

The cost of planting Para grass has been carefully estimated by the station. It was found that the planting of the roots cost \$10 per acre; the cuttings, \$7.20 per acre; the stalks in furrows, \$3.60 per acre; and the broadcasting, \$3 per acre. From these results it is seen that the method of broadcasting is less than one-third of the cost when the roots are set out, less than one-half when the stalks are set in the ground as cuttings, and five-sixths when the grass is planted in fur-

rows. The cost is such a small matter in comparison with the gains accruing later from the grass as an improved forage that it should not be considered a hindrance to increased plantings.

HARVESTING AND YIELDS.

There is no specific time at which to harvest Para grass. It should be cut while still tender and succulent, usually any time before it matures seed. Generally it is cut when it reaches a height of 30 or 40 inches. When the grass is allowed to stand too long before cutting the stems become coarse and unpalatable. From 3 to 10 cuttings a year are possible, though this depends upon the fertility of the soil and the stage of growth when cut. The yield is heavy, the lowest yield at the experiment station for a period covering 50 cuttings averaging 12.16 tons a year. The highest average yield covering a period of 42 months has been 34.92 tons of forage per annum.

CARRYING CAPACITY AND FEEDING VALUE.

It is important that Para grass become well established before it is allowed to be pastured. Results obtained from the Piti and Cotot pastures showed that the carrying capacity of Para grass given reasonable care was easily one animal unit² to an acre of grass. In feeding tests made by the station the Para grass has been found far superior to the native grasses. Cattle, horses, hogs, and goats very readily eat it and keep in good condition, while the animals pastured on native grasses either lose weight or do not gain nearly so rapidly as those on the introduced grass.

PASPALUM GRASS.

This has been found to be one of the best pasture grasses for Guam. It is a smooth grass, producing at the surface of the ground many leaves in a clump. The leaves grow from 18 to 30 inches in height, and the seed stems are from 12 to 18 inches longer. However, the grass loses its bunching effect and makes the best pasture when kept eaten down.

Paspalum has been grown by the station with excellent results during the last 10 years throughout the wet and dry seasons. Its ability to withstand extremes of drought and rainfall makes it a very valuable grass for Guam. On account of its strong and deep root system it is able to withstand drought so severe as to kill the ordinary grass. While Paspalum is primarily a pasture grass, it is one that seems very well suited to all soil conditions. It thrives well on poorly drained soil during long periods of heavy rainfall; it does well without irrigation during the dry season when pasturage from native

² An animal unit may consist of 1 mature horse or cow, 2 colts or calves, 5 head of hogs, 10 pigs, or 100 chickens.

grasses is scarce; and it has been planted with satisfactory results on exceptionally heavy clays, on medium clay soils, on the sandy beaches, and on hillsides where outcropping rock and cascajo formed the principal part of the surface. There is little or no doubt that a good stand can be obtained on all but the poorest or undrained soils if the roots are placed close together. In this particular it should be noted that on the undrained soils Para grass gives the greatest yields both for pasture and for soiling purposes. However, it has been found that on the poorer soils extreme care in pasturing is necessary, as too heavy grazing destroys the stand, but even on the hillsides and during severe droughts, when other grasses are practically worthless, *Paspalum* will make considerable growth. From comparative tests it has been found that *Paspalum* grows better on higher and poorer land, withstands heavier pasturing, and survives a severe drought with less damage than Para grass.

Another feature about this grass is that it readily withstands the trampling of stock during wet weather. In fact, trampling when the soil is wet and muddy has a tendency to spread the grass and keep down the tuft or bunching effect. No other grass tested by the Guam experiment station has withstood the climatic conditions or been liked by live stock so well.

PLANTING.

The time of planting *Paspalum* in Guam depends almost entirely upon local climatic conditions. In general it is best to plant this grass at the beginning of the rainy season when there is certainty of sufficient moisture. Though *Paspalum* grass is a persistent grower and able to withstand long droughts, it needs to be well established and have time to develop a strong root system to successfully withstand an extended dry season or heavy grazing. The more favorable the soil for the growth of the plant the sooner the grass will be ready for grazing. Under ideal conditions for rapid growth the new plantings should not be pastured for at least four months after being transplanted. On higher lands it takes longer for the grass to become established, and fully six months should elapse before live stock is allowed to pasture the fields. When pasturing is allowed too soon the plantings are destroyed. In some instances it is best to delay heavy pasturing several months.

Careful preparation of the soil is desirable and should be given before *Paspalum* is planted. As is true of other plants, a good seed bed or a well-prepared home for the many fibrous roots of this grass causes it to grow much faster and assures the farmer of a better stand. The soil preparation, of course, depends almost entirely upon the location of the pasture. On most of the hills it is impossible to plow on account of the rocky nature of the soil. In these places all the grass,

weeds, and shrubs should be removed. The root clumps can then be planted in holes made by a fosiño. On soil of this kind the grass should be weeded with fosiños two or three times to keep it clean until it is well started.

On land that is free from rocks and stumps the best method of preparation is to plow as is done for corn or for Para grass, only the furrows should be made closer together. In newly cleared land that is full of stumps it would probably be best to use the fosiño to prepare the holes for sods. A stroke or two with the tool will open a hole sufficient for setting the sods. The sods are placed in the hole and the soil firmed around it by hand.

There are three parts of the plant that can be used in planting—the seeds, cuttings, and roots. In Guam the planting of roots or small sods has been found the most satisfactory method. In this case a small plat of *Paspalum* can be made to furnish sufficient material for a large area whenever wanted. The fields can be planted at any time when conditions are right. The grass rapidly spreads and grows, and is ready for grazing before plantings by either of the other methods are well started.

Size of sods, or root division, and the distances of planting are important matters to be considered when *Paspalum* is planted. In general it has been found that the smaller divisions and a greater distance of planting may be practiced on the lower lands. Planting tests have shown that sods cut into pieces about 2 inches square and planted 12 inches each way give the best results on the several types of soil. Sods suitable for planting are made from a well-covered plat of *Paspalum*. Fosinos, spades, machetes, plows, or mattocks are used for taking up the sods and for cutting them into pieces of the size wanted. The sod cuttings are then placed in bull carts, sacks, or boxes and carried to the prepared field. Damp or rainy days are best suited for transplanting.

FEEDING VALUE.

Nearly every class of live stock relishes *Paspalum* at all times and keeps in good condition when pastured on it. When not pastured for some time *Paspalum* may become rather fibrous and tough during the dry season. That it remains succulent and nutritious while being pastured is proved by the condition of animals pastured upon it compared with others on native forage.

It has been thoroughly demonstrated time after time that *Paspalum* will easily support two or three and in most cases several times as many cattle as the same area planted to native grasses. In fact, cattle that have free range over several hundred acres of native pasture land are invariably in poor condition and during the dry season many are lost, while a much smaller area planted to *Paspalum*

carries a herd over in good condition and without any loss from lack of nutritive feed. The carrying capacity of Paspalum is high. In the tests made at the experiment station it was estimated to pasture easily one to three animal units per acre the year round on ordinarily good soil.

WHERE TO OBTAIN PLANTING MATERIAL.

The Guam Agricultural Experiment Station located at Piti maintains areas of Para and Paspalum grasses sufficient to supply roots and stems to all who ask for them. There is no charge for planting material of either of the grasses.



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